



Safe Use of All-Terrain Vehicles (ATVs) on the Farm¹

William J. Becker²

The all-terrain vehicle (ATV), also known as three-wheelers (Figure 1) and four-wheelers, (Figure 2) was initially developed in Japan as a farm-to-town vehicle in isolated, mountainous areas. During spring thaws and rainy seasons steep mountainous roads were often impassable with conventional vehicles. It soon became a recreational vehicle, however, providing transportation to areas inaccessible by other motorized transport. And, it wasn't long before the Japanese manufacturers realized that the ATV could be sold to Americans.

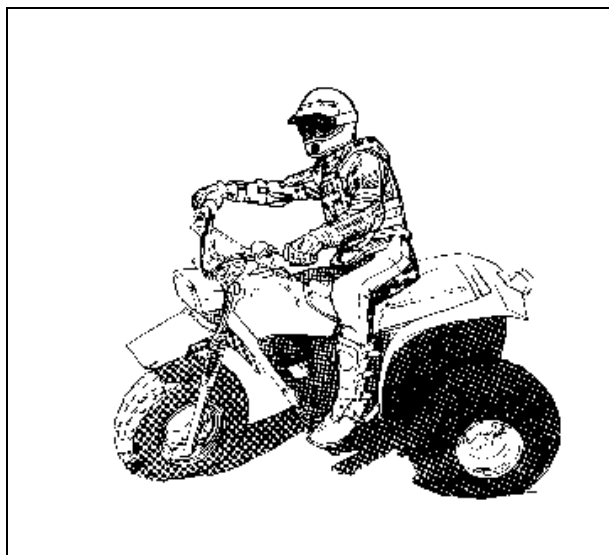


Figure 1. Three-wheeled ATV.

When the ATV first appeared in the United States in the 1970's, it was promoted and sold as a recreational vehicle designed to provide "thrills" for the rider. This is still its primary use today. Shortly, however, sportsmen found that the ATV was a useful machine to move through areas not accessible with pick-up trucks, four-wheel drives, or other motorized vehicles. The ATV became popular as a hunting vehicle and was used to reach remote areas and to transport game back out.

THE ATV IN AGRICULTURE

By the mid-eighties the ATV was finding a use in agriculture. It was found to be an efficient and economical substitute for the pick-up truck, the horse, the tractor, and even for walking in many operations. They can now be found on all types of farms, ranches, groves, in the forest, in the ornamental nursery, and on the golf course.

ATVs are now used to inspect crops and livestock, to inspect and repair irrigation systems and fence lines, to supervise field crews, to herd livestock, mark timber, to seed, to fertilize and apply chemicals, to mow grass, to move dirt, and to transport things from here to there and back again. The uses are unlimited.

An ATV offers a new sense of freedom to individuals with mobility handicaps: it can be the wheelchair for the farm, ranch and grove. With the ATV, physically handicapped farmers, ranchers and others can travel over hundreds of acres, through areas

1. This document, AE-71, was published August 1988 and last reviewed October 1992 by the Florida Cooperative Extension Service. For more information contact your county Cooperative Extension Service office.
2. Professor and Extension Safety Specialist, Agricultural Engineering Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences (IFAS), University of Florida, Gainesville, Florida 32611.

The Institute of Food and Agricultural Sciences is an equal opportunity/affirmative action employer authorized to provide research, educational information and other services only to individuals and institutions that function without regard to race, color, sex, age, handicap, or national origin. For information on obtaining other extension publications, contact your county Cooperative Extension Service office.

Florida Cooperative Extension Service / Institute of Food and Agricultural Sciences / University of Florida / John T. Woeste, Dean

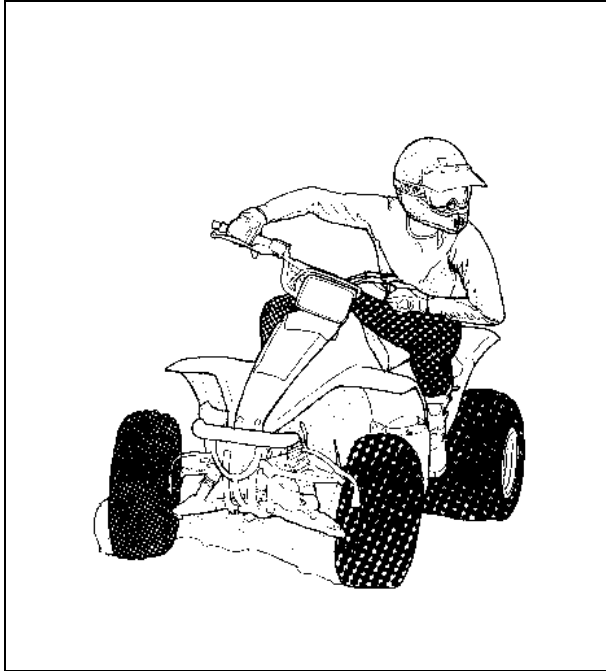


Figure 2. Four-wheeled ATV.

which might be inaccessible to them by other means. It can enable them to take a more active role in the operations and management of the business; they can become more productive persons.

ATVS CAN BE DANGEROUS

The Consumer Product Safety Commission reports that annually an estimated 90,000 individuals are treated for ATV-related injuries in hospital emergency rooms; nearly 10,000 are hospitalized and over 120 deaths are recorded. Nearly fifty percent of the injured persons and fatalities were young people under 16 years of age. Twenty percent of the fatalities were children under 12 years of age. A recent study indicated that 16.4 percent of all ATV accidents occur on the farm, resulting in over 20 fatalities annually on American farms. This number is expected to grow as the ATV becomes a more common agricultural machine.

Clearly, the ATV can be a dangerous vehicle. Some ATV operating guidelines are:

- ATVs are not toys; children under the age of 12 years should not operate, or be permitted to ride, one.
- Children between the ages of 12 to 15 often lack the physical size to operate or control the machine.

They should not operate adult-size (greater than 90 cc) ATVs.

- Do not ride double; the unique handling characteristics of the ATV require that the operator shift his weight and position on the seat to steer and control the vehicle. Riders hamper the operator's ability to steer and control the ATV.
- A hands-on training course, given by a competent instructor, is necessary for all ATV operators, who must be physically strong and emotionally mature. Inexperienced drivers, in their first month of using an ATV, have 13 times the average risk of injury.
- Helmets, heavy gloves and boots should always be worn. Without the protection of a helmet, the risk of severe injury or death is twice as high.
- Ride four-wheeled ATVs only. They are more stable than three-wheel ones. The risk of accidents is nearly twice as high with a three-wheeled ATV.
- Purchase only fully suspended ATVs. They handle better than front-only or tire-only suspended ones.
- Since ATVs are small and low to the ground, they are not as visible as larger vehicles. Use lights, reflectors, and highly visible flags so the ATV is easier to be seen.
- Never ride the ATV on public roads, or with alcohol or drugs in the bloodstream. In nearly 10 percent of all injuries, and in 30 percent of all fatal ATV accidents, alcohol use was a contributing factor.

SELECTING AN ATV FOR WORK

Purchase a "workhorse" ATV, not a "thrill-type" recreational model. The workhorse model is four-wheeled, designed for power, traction and stability. The recreational models are built for speed and thrills. When selecting an ATV for your business, there are numerous factors and features to consider: intended use of the ATV, terrain and ground conditions, power, speed, gear ratio, suspension, center of gravity, drive mechanism, brakes, lights, starter, seat, carrying racks, and reverse gear are major concerns.

Three-Wheeler or Four-Wheeler?

The answer is simple. Purchase four-wheeled ATVs. They are more stable, and less prone to side overturns. In addition, more traction is provided, and one can

straddle a row in certain crop operations. In soft ground, four-wheelers break two tracks, one less than a three-wheeler, thus four-wheelers are easier to steer. But, the overwhelming asset of the four-wheeler is its stability. The tricycle-style tractor has lost much of its popularity because of its lack of stability, resulting in many serious side overturns. The three-wheeled, tricycle-type ATV is far more prone to side overturns than is the four-wheeled ATV.

Rear overturns are another problem. They can be caused by climbing steep slopes, "popping-the-clutch" on a surface which provides excellent traction, or by attempting to carry or tow too heavy a load. Heavier, four-wheeled ATVs with low center of gravities are the safest. A unique feature of the ATV is that operator position on the seat can significantly change the center of gravity. Moving forward will reduce the risk of rear overturns. Two general rules are to not carry more than one-third the vehicle's weight on the rear carryall and never tow a load heavier than the weight of the ATV plus the operator's weight.

Suspension Systems

The only suspension system provided by some ATV models is the low pressure (usually two to six psi) balloon tires. They can provide a smooth ride and good vehicle control at slow speeds on a smooth surface. However, with added speed or on rough terrain, they tend to bounce and pitch up and down and from side to side. Control of the machine becomes more difficult and the ride is more tiring on these models.

Some models have suspension systems only on the front wheel(s), others on all four wheels. Some use only coil springs, others use both shock absorbers and coil springs. The latter type, both coil springs with shock absorbers, provides the best traction, maximum control and the smoothest ride. Other models are more likely to cause or aggravate back or leg problems.

Drive Lines

ATVs may have automatic clutches, hand clutches, or fully automatic transmissions. Some have a reverse gear. Other models have power take-off drives. There are ATVs with chain drives or shaft drives. Others have solid drive axles, while others have differentials which allow the rear wheels to turn independently. Most differentials can be "locked", causing both wheels to turn uniformly to provide additional traction.

For most agricultural operations, an ATV with an automatic clutch, reverse gear, shaft drive and a differential with a locking mechanism would be appropriate. A solid-drive axle or a locked differential give the ATV its unique, difficult and dangerous turning characteristics. Since both rear wheels rotate at the same speed the weight of the machine must be reduced on the inside rear wheel to enable it to turn. The inside rear wheel can then slip throughout the turn. This maneuver by the operator--shifting his weight forward and to the outside foot peg or rest--causes the machine to be less stable and increases the risk of a side overturn. However, at lower speeds, the differential unlocks and allows the rear wheels to turn independently.

An automatic clutch reduces chances of "popping-the-clutch," which can result in rear overturns. The advantages of a reverse gear are obvious. The solid shaft drive is more trouble-free than a chain drive and is nearly always found on ATVs with a differential.

A power take-off is available on some models, for operating mowers, spray equipment and other machinery. The anticipated use of the machine would determine whether or not this feature is desired.

Power and Speed

ATVs come equipped with engines ranging from less than 100 cc to over 500 cc, and with gear ratios which will permit speeds in excess of 50 mph. The use(s) planned for the ATV should determine the size of the engine and the gear ratio. There are few, if any, reasons why a maximum speed of more than 20 to 25 mph is required for any agricultural operation. Serious ATV accidents are frequent at higher speeds. Make sure the ATV's gear ratio fits your needs.

Other Features

ATVs can have electric, kick, or pull recoil starters. Recoil starters are less expensive but can be frustrating if the engine is hard to start. Electric starters require a battery, which is more convenient but more costly.

The ATV should have both front and rear brakes with independent controls. The seat should be wide enough to give good support and be well-padded to prevent "saddle sores." A light-colored seat will stay cooler when exposed to the hot sun.

The rear fenders and foot peg or rest should be designed to make it difficult or impossible for the foot to slip off and be caught under the rear wheel.

Roll bars, safety belts, and deflectors to keep branches from striking operators are available for some models. Safety belts should never be used without a roll bar, but always with a roll bar. The use of the ATV should determine if these safety features should be added.

The muffler, exhaust, and other hot engine components should be located, or guarded, to prevent burns. The design should also prevent the buildup of dry trash near hot exhaust parts to reduce the risk of fire.

If carrier racks are installed on the ATV, both front and rear racks are recommended. This permits the load to be balanced front and back to maintain stability. Remember, an extra load, such as carrier racks or a passenger, significantly raises the center of gravity of the loaded machine and increases the risk of an overturn.

PREPARING TO OPERATE THE ATV

Before beginning to operate the ATV, three questions should be considered. First, is the operator ready? Second, is the ATV ready? Third, have the hazards of the environment and task been considered? Each question should be completely answered.

Is the Operator Ready?

Do not be an unprepared operator, and don't permit others to operate an ATV if they are ill-prepared. Quality training should be provided. Most ATV dealers can recommend qualified instructors. Operators should also be familiar with the ATV owner's manual, particularly with the operation and safety aspects of the manual.

Additionally, operators must be physically and mentally capable of handling the ATV safely. They must be alert, awake and clear-headed. They must wear the appropriate personal protective equipment.

Is the ATV Ready?

This is more than having adequate fuel and starting the engine. The machine should be maintained in accordance with the owner's manual. Give special attention to the tires, brakes and throttle. The tires must be uniformly inflated (2 to 6 psi); a one-pound difference in air pressure can cause control problems. To accurately measure pressure, you will need a low-pressure gauge; regular tire gauges will not be accurate enough. The brakes must be adjusted to insure a safe, straight stop. Check that the throttle operates smoothly in all steering positions. Regularly check all bolts and nuts, particularly the axle and wheel lug nuts. When a wheel is changed, the lug nuts should be tightened every two hours until they set.

Are there Task and Environmental Hazards?

Consider the task and travels for the day or trip. What are the tasks and environmental hazards which might be encountered? Give special attention to roads, terrain, slopes, canals, ditches, blind intersections, trees, shrubs, other vehicles, etc. that might cause accidents. It is difficult to avoid potential accident situations if operators are unaware of, or fail to recognize, the hazards.

PERSONAL PROTECTIVE EQUIPMENT

The hazards involved in operating an ATV demand serious consideration be given to proper personal protective equipment (Figure 3).

Helmet

Most experts recommend that a full-face helmet always be worn when riding an ATV, but many agricultural uses of the ATV are at low speed where the helmet may obstruct vision or be too uncomfortable. However, if you are traveling at speeds in excess of 10 mph, a full-face helmet should be worn. It should fit snugly and be securely fastened, and bear the American National Standards Institute label (ANSI z90.1 or equivalent).

The majority of serious accidents occurs when the ATV overturns or collides with another vehicle or a

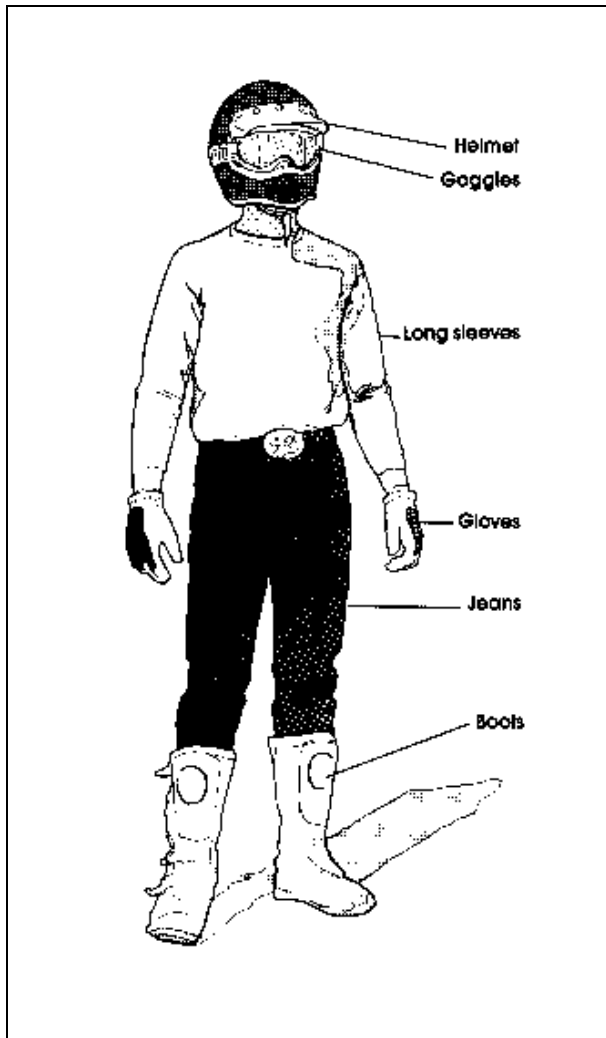


Figure 3. Proper protective clothing for riding ATVs.

fixed object. Speed is often a major contributing factor. An accident at five mph may not cause an injury, but at 30 mph it could be fatal. Helmets often mean the difference between life and death in these types of accidents.

Face Shields and Goggles

For some operations, such as seeding, mowing, etc., at slow speeds, no head or face protection may be needed other than a hat or cap to provide protection from the sun. For other slow-speed operations, such as working in citrus groves, woodlands, or ornamental nurseries, a full-face shield or goggles should be worn. One branch or thorn in the eye and your sight might be lost. At higher speeds, face or eye protection should always be worn. A branch, small item, or even an insect could cause a serious eye injury.

The goggles or face shield should carry the American National Standard Institute label (ANSI Z87.1 or equivalent) on the bottom or side of the lens or shield. Make certain the face shield or goggles are clean and reasonably free of scratches. Grey- or green-tinted shields or goggles are best in bright sunlight, but after sundown only clear lens shield or goggles should be worn.

Boots or Shoes

Quality boots, or over-the-ankle work shoes with good heels, are a must. No one should be allowed to operate an ATV with anything less. Ideally, the soles and heels are made of slip-resistant materials, not leather or neoprene-type materials. While motorcycle or ATV-type boots are best, a good quality pair of over-the-ankle, tightly-laced work shoes are adequate for most agricultural operations.

Gloves and Clothing

These should be determined by the task. Normally, long-sleeved shirts, full-length trousers and well-padded gloves are recommended. They should be worn in grove, nursery, and forest-type environments, to protect your hands, arms, legs and body from serious cuts and punctures. Avoid loose-fitting clothes which could easily catch on a branch. However, in an open-field operation, less protective or different protective clothing might be dictated by the task.

DRIVING THE ATV

Being prepared to drive and having a safe machine to drive are good beginnings, but there are some other essential rules to follow.

- Never carry passengers.
- Always keep your ATV under control. Slow down whenever conditions demand it, such as on slippery, rough terrain, on slopes or near canals and ditch banks. Ride within your own limitations and those of your ATV.
- Stop at all blind intersections, at corners of buildings, and coming out from between rows of trees or shrubs onto a headland or field road.
- Do not overload the front and/or rear carriers, and keep the load balanced.

- Driving after dark increases the risk of an accident. Even with lights many hazards cannot be seen.
- Ride off the road only, never on public roads. Merely crossing a public road is dangerous and illegal. Driving on paved surfaces will damage tires rapidly. Control of the ATV on paved surfaces is more difficult.
- If you have questions, ask for help. Learning by trial and error can be hazardous to your health.

RECREATIONAL USES

After your work is done, you may want to use your ATV for recreation. Now, more than ever, make certain that both you and your machine are properly prepared. Traveling on unfamiliar and hazardous terrain at high speeds significantly increases the risks of accidents, injuries and death. This is no time for "macho" attitudes or immature judgment. As with any vehicle, never drink and drive. It is time to follow all safety practices and to wear all protective equipment. Travel with a buddy (on a second ATV); never alone. An accident far from help can result in a minor injury becoming serious, and a serious injury may become a fatality.

Teenagers should never drive an ATV unless they have had proper training, are fitted to a properly sized ATV, are wearing all the recommended protective clothing and equipment, and their riding is closely supervised. Too many young people have been seriously injured or killed riding ATVs for the "thrills".

REMEMBER, NO EXTRA RIDER EVER!

Finally, be courteous and conservation-minded. Never ride an ATV where it is prohibited or can damage the environment. Ask permission of owners before riding on their property.

SUMMARY

An ATV is a relatively new and useful tool in many agricultural settings but, by its very nature, it can be dangerous. Nevertheless, if the machine is a four-wheeler, is matched to the task and properly maintained, if speed is limited, if the operator is adequately trained, properly clothed and equipped, and is a safety-conscious individual, the risk of an accident can be kept to a minimum. Three-wheeled ATVs ARE NOT recommended for agricultural use. They are just too dangerous. However, safe four-wheeled ATVs, operated by a safe operator in a safe environment, can result in an efficient and effective operation.